The African Development Bank and infant mortality: A cross-national analysis of structural adjustment and investment lending from 1990 to 2006

Carolyn Coburn
State University of New York at Stony Brook, USA

Michael Restivo
State University of New York at Geneseo, USA

John M Shandra
State University of New York at Stony Brook, USA

Abstract

We conduct a cross-national analysis to examine the effects of different forms of African Development Bank (AfDB) on infant mortality. We analyze data on 31 countries from the period 1990–2006 using a two-way fixed effects regression model. The results of our analysis indicate that Sub-Saharan African nations receiving an AfDB structural adjustment loan are associated with increased infant mortality compared to nations that do not receive such a loan, consistent with existing literature drawn from dependency theory. We also evaluate a second hypothesis that AfDB investment loans in the health sector will be associated with decreased infant mortality, and the results of our analysis confirm this as well. We conclude by highlighting the contradictory effects of these two lending strategies on infant mortality and the theoretical implications that emerge.

Keywords

Introduction

The 'debt crisis' of the 1970s and 1980s was highlighted by an inability of many Sub-Saharan African nations to make payments on their foreign debts (Peet, 2003). The International Monetary Fund (IMF), World Bank (WB), and regional lenders responded by rescheduling debt payments

Corresponding author:
John M Shandra, Department of Sociology, State University of New York at Stony Brook, Stony Brook, NY11794, USA.
Email: john.shandra@stonybrook.edu

and providing new loans to indebted nations. These structural adjustment loans were designed to resolve balance of payment issues by requiring indebted nations to institute a variety of macro-economic policy reforms in return for the money (Rich, 1994). The reforms included devaluing currency, reducing government spending, boosting exports, and promoting privatization (Bryant and Bailey, 1997). The underlying logic behind structural adjustment lending is an attempt to stimulate economic growth and generate currency for debt repayment by increasing revenues while cutting costs.

While the 'earn more' and 'spend less' model may facilitate debt repayment, dependency theory suggests that structural adjustment should adversely impact health (Bradshaw and Huang, 1991). There are several reasons why this is the case. First, structural adjustment loans often require cuts in government spending for health (Peet, 2003). This translates into facilities closing, not being fully staffed, or being staffed by inexperienced health providers. Furthermore, structural adjustment often forces poor nations to privatize government assets (e.g. hospitals, clinics), which reduces essential services due to user fees being charged (Grusky, 2001).

Accordingly, cross-national research supports hypotheses drawn from dependency theory. Bradshaw et al. (1993) is perhaps the most notable example. The authors find that IMF structural adjustment is associated with higher child mortality. Similarly, Buchmann (1996) finds that it is related to higher maternal mortality. More recently, Shandra et al. (2011) find that Sub-Saharan African nations that receive a WB structural adjustment loan tend to have higher levels of child mortality than Sub-Saharan African nations that do not receive such a loan. At the same time, cross-national research indicates that Sub-Saharan Africa has higher levels of child mortality (Scanlan, 2010) and malaria (Austin et al., 2014) than other regions of the world.

Despite the theoretical and empirical literature regarding the adverse impacts of IMF and WB structural adjustment and cross-national work that documents that Sub-Saharan Africa tends to have more pronounced health problems, there has been little attention paid to how structural adjustment loans originating from the African Development Bank (AfDB) affect health in the region. This is somewhat surprising because the AfDB has been making structural adjustment loans since the mid-1980s and has disbursed the most structural adjustment loans in Sub-Saharan Africa (Babb, 2009). This lacuna serves as starting point for our study.

At the same time, we also consider the impact of AfDB investment loans in the health sector. These loans tend to fund the building of hospitals, training of doctors, financing of immunization campaigns, and distribution of necessary drugs (AfDB, 2006). We do so because the AfDB expanded lending in this sector in response to pressure it received from the United Nations, non-governmental organizations, and lawmakers in donor nations, following the publication of the United Nations Children's Fund (UNICEF) report entitled 'Adjustment with a Human Face' (Jolly, 1991; UNICEF, 1987). The report highlighted that structural adjustment policies in Sub-Saharan Africa had 'severely hampered the maintenance and expansion of health, education, safe water, sanitation, housing, and other services vital to children' and called on multilateral lenders to put policies into place to mitigate such problems (UNICEF, 1987: 6).

We now turn to a discussion of dependency theory and how our study fits into this tradition. We then move on to the history and structure of the AfDB along with why it began making structural adjustment loans in the first place. We follow by talking about the potential impacts of structural adjustment on health and then move on to a discussion of the campaign against the AfDB to change its adjustment lending. This mainly involved a commitment to increase investment lending in the health sector. We go on to describe the variables used in the analysis, the methodology, and the findings. We conclude by elaborating upon the theoretical, methodological, and policy implications that follow from the results.

Dependency theory and health in a cross-national perspective

According to dependency theory, economic relationships among high-, middle-, and low-income nations are structurally detrimental for the middle- and low-income nations because of the inherent dynamics of international capitalism (Amin, 1976). The high-income nations become wealthy by exploiting surplus labor and natural resources of low- and middle-income nations (Frank, 1967). This exploitation and concomitant health problems in low- and middle-income nations have been shown to result from commodity concentration (e.g. Shandra et al., 2004), export partner concentration (e.g. Shen and Williamson, 2001), multinational corporate investment (e.g. Wimberley, 1990), or debt repayment (e.g. Frey and Field, 2000).

There has been cross-national research that examines the impact of IMF and WB structural adjustment on health. The literature on the relationship between structural adjustment lending is large and diverse. We note several cross-national studies in the introduction that examine the impact of IMF or WB adjustment on children and maternal health. More recently, this line of research has been extended to examine other factors such as health issues – see Austin (2015) and Kentikelenis et al. (2015) for recent dependency and dependency-related approaches to structural adjustment and impacts on health. Our study follows in this tradition but expands it by considering the impact of how a regional international financial institution, the AfDB, affects health in Sub-Saharan Africa.

The AfDB: a brief overview

The AfDB was established in 1964 by 35 African nations. Unlike the Inter-American Development Bank and the Asian Development Bank, membership in the AfDB was open only to African nations (English and Mule, 1996). The creation of an exclusively African institution was a demonstration of the continent's ability to promote development without support from abroad and an outward manifestation of members' efforts to rid themselves of their colonial legacy (Mingst, 1990). The AfDB also claimed that it was better suited to make loans than other multilateral donors because its African character enabled it to better understand economic challenges unique to the continent and to appear as a more legitimate development agency among African stakeholders (Babb, 2009).

The AfDB began by making loans available to support basic infrastructure construction (English and Mule, 1996). However, there were financial implications that followed from creating an exclusively African institution. The AfDB was only able to provide non-concessional loans or loans with interest rates and repayment schedules similar to market rates to member nations. This was due to it lacking enough capital reserves to support concessional lending that carries low interest rates and longer repayment schedules (English and Mule, 1996). Thus, many of the poorest members of the AfDB could not qualify for the loans (Mingst, 1990). Additionally, member nations that did qualify were in arrears on both subscriptions and outstanding non-concessional loan payments (English and Mule, 1996).

Thus, the AfDB established the African Development Fund (AfDF) in 1973, which would offer concessional project loans. The capital came from non-regional governments who would become AfDF members (English and Mule, 1996). The majority of funding comes from 13 non-regional members with the United States and Japan providing the most money (Mingst, 1990). The AfDB contributes roughly three percent to the AfDF's total budget (Babb, 2009). In an effort to preserve the African character of the AfDB, the AfDF was given its own governance structure and board of directors comprising regional members and non-regional members. Although the non-regional members contributed the bulk of funding to the AfDF, non-regional and regional members were accorded equal voting power. The voting powers in the AfDB remained unaltered (Mingst, 1990).

Despite the new influx of capital that accompanied the creation of the AfDF, the AfDB's lending capacity was eroded by the sharp increase in the price of oil during the early 1970s (Mingst, 1990). Thus, in 1977, the AfDB approved the entry of non-regional members beyond participation in the AfDF. However, it spent the next 5 years negotiating the terms that would ensure the institution maintained its 'African' identity (Babb, 2009). By 1982, non-regional members were officially admitted to the AfDB and granted one-third of the total voting power on the board of directors. The AfDB's charter was modified, however, to retain its 'African' character by ensuring that its headquarters would continue to be located in Africa and that its president would always be a citizen of a regional member nation (Mingst, 1990). Furthermore, regional governments maintained a majority of voting shares on the AfDB's Board of Directors, allowing easy veto of non-regional member proposals (AfDB, 2010).

The rise of structural adjustment at the AfDB

While the addition of non-regional members increased the amount of capital available for investment, the debt crisis created a situation in which Sub-Saharan African nations could not generate enough revenue to make payments on their existing loan obligations (Peet, 2003). As a result, the AfDB sought to increase the number of structural adjustment loans it was making in order to meet the demand for general balance of payment support, which would keep essential imports (e.g. oil, fertilizers, pesticides, machinery) flowing into Sub-Saharan Africa (English and Mule, 1996). This demand was buoyed by two other factors: traditional project lending being too slow to have an immediate impact on a country's balance of payment issues and nations already being in arrears on existing AfDB loans (Mingst, 1990).

Consequently, the AfDB began making structural adjustment loans during the early 1980s to deal with balance of payment issues and to improve the ability of Sub-Saharan African nations to repay existing loan obligations (Mingst, 1990). By 1985, structural adjustment accounted for nearly 25 percent of its portfolio (AfDB, 2010). The percentage of structural adjustment loans has steadily increased ever since (Babb, 2009).

The increase occurred for a number of reasons. First, in return for providing money for the AfDB's fourth capital increase and the AfDF's fifth replenishment completed in 1986 and 1987 respectively, non-regional members, especially representatives from the United States Treasury, demanded that the AfDB make more adjustment loans (English and Mule, 1996). Babb (2009) notes, 'The Treasury was reporting that the United States had accomplished its major policy objectives in the AfDB and, consequently, agreed to a $3.5 billion increase in funding', with United States Treasury Secretary Nicholas Brady concluding that 'the bulk of the AfDB's resources will now be allocated to countries that are providing an economic environment conducive to development and growth' (i.e. implementing reforms called for under adjustment) (p. 106).

Second, the AfDB accumulated bad debts during 1990s as many of its borrowers sank into arrears and economic stagnation (Babb, 2009). This situation led Standard and Poor's to downgrade the AfDB's bonds from AAA to AA+ in 1995. Consequently, non-regional donors responded by delaying financial support for the AfDB's seventh replenishment (Mingst, 1990). Ultimately, non-regional members agreed to bail out the AfDB again. However, it was contingent upon major restructurings. Most notably, non-regional members wanted more resources devoted to structural adjustment. To ensure this happened, non-regional members also required changes in their voting share at the AfDB, increasing if form from 23 to 40 percent. Furthermore, voting rules for the articles of agreement were modified to require a 70 percent majority, which effectively gave non-regional members a veto in the AfDB's decision making (Babb, 2009).

The impacts of structural adjustment on infant mortality

The links between structural adjustment and infant mortality are complex, but here we review three explanations for why this relationship may exist. First, AfDB structural adjustment loans usually require deep cuts in government spending to correct for budgetary imbalances (Rich, 1994). The nature of these cuts varies from nation to nation, but a common theme has been a reduction in the budgets and staffs of medical facilities (Bryant and Bailey, 1997). This has led to widespread closing of such facilities. The locations that remain open are often understaffed and without essential medical supplies (Ismi, 2004). In order to compensate for the lost revenue, governments often implement user fees for basic health care, which has created a 'two-tier' system in which the poor are denied access because they cannot afford to pay the fees (Kamara, 2000). As a result, many diseases (e.g. malaria, cholera, HIV) that lead to complications during pregnancy and first year of an infant's life go untreated (Ismi, 2004).

Second, the AfDB often requires nations to privatize government assets (e.g. hospitals, schools, water systems, sanitation facilities, and electricity grids) (Bryant and Bailey, 1997). The selling of assets generates cash for governments to pay off their debt in the short term. However, it also reduces the ability of a country to generate revenues, thereby impeding investments in health, education, and other social services in the long term (Rich, 1994). Furthermore, when government services become privatized (e.g. heath, education, water, sanitation, and electricity), companies will often subsequently implement user fees in order to generate a profit but often limit access (Grusky, 2001).

Third, structural adjustment requires governments to reduce the size of the public sector labor force (Marphatia, 2010). This occurs when the AfDB sets limits or ceilings on a government's wage bill, which is the budget line associated with hiring public employees (Marphatia, 2010). When ceilings are put into place, governments are not able to hire enough trained health professionals, especially doctors, nurses, and midwives with obstetrics training (International Labor Organization, 2007). For instance, Buckley and Baker (2009) estimate that the percentage of births attended by a skilled health attendant in Uganda declined from 52 percent to 38 percent following the implementation of AfDB structural adjustment loans. The elimination of public sector jobs also translates into less qualified individuals being hired for lower wages in order to extend coverage while cutting costs (Marphatia, 2010). Furthermore, Tripp (1992) describes that an AfDB structural adjustment loan led to such low levels of pay for doctors and nurses in Tanzania that most left their jobs and sought employment abroad. While setting ceilings on a government's wage bill is attractive from a budgetary perspective, the disadvantage is that the quality of care declines (Tripp, 1992).

This discussion leads up to our first hypothesis drawn from dependency theory. We argue that a Sub-Saharan African nation that received an AfDB structural adjustment loan will have increased infant mortality than if it did not receive such a loan.

Pressuring the AfDB on structural adjustment

The AfDB along with the IMF and WB initially dismissed calls for reform following publication of the UNICEF's 'Adjustment with a Human Face' (Jolly, 1991). This dismissal was based on several factors. First, they argued that there would be short-term adverse effects on the poor, but structural adjustment lending was necessary to ensure long-term economic growth (Rich, 1994). Second, it emphasized the necessity to distinguish the effects of structural adjustment and mismanagement of finances by governments when considering the impact of their lending (Bryant and Bailey, 1997). Third, some expressed concerns that emphasizing the human 'costs' might divert

attention and political will from what they say was the main priority – macro-economic reform (Jolly, 1991).

Nevertheless, UNICEF remained undeterred by this response. It partnered with the World Food Program to organize a policy workshop dealing with the impact of structural adjustment on children's nutrition. The workshop provided a forum to offer ways to address the aforementioned concerns and offered possible reforms that could be put into place to address issues raised in 'Adjustment with a Human Face' (Jolly, 1991). This workshop was followed by meetings with field staff that focused on collaborations for implementing an inter-agency effort to mitigate the adverse impacts of structural adjustment in Sub-Saharan Africa. This included an effort to deliver food aid to rural areas in Ghana, which were most affected by structural adjustment (Jolly, 1991).

There were also events taking place beyond the United Nations that directed considerable attention to the concerns being raised by UNICEF and its partners. First, Richard Jolly delivered the Barbara Warm Memorial Lecture at the 18th World Conference of the Society for International Development to an audience of several hundred people that included WB employees (Jolly, 1991). At a panel, 'Adjusting to New Realities', the following day, many of the same issues were discussed. WB President, Alden Clausen, along with senior officials from other multilateral lenders (i.e. AfDB) were in attendance. They were forced to acknowledge publicly (albeit tepidly) for the first time the mounting evidence regarding the adverse effects of structural adjustment on health (Jolly, 1991). This public acknowledgment led to employees at multilateral lending institutions to share copies of 'Adjustment to a Human Face' with their colleagues (Jolly, 1991).

Second, a meeting of the Sub-Committee on Nutrition of the Administrative Coordinating Committee of the United Nations, which is composed of representatives from every major United Nations agency, representatives from donor governments, and nutrition experts, chose 'Nutrition and Economic Adjustment' as its meeting's theme (Jolly, 1991). It is worth noting because it was the first time representatives from several multilateral lenders including the AfDB attended. While initially defensive, the officials acknowledged that it was concerned with nutrition but lacked the staffing and expertise to incorporate such concerns into adjustment policies for their institutions (UNICEF, 1987).

Third, non-governmental organizations worked with UNICEF to publish several reports that highlight other ways that structural adjustment was affecting people beyond Sub-Saharan Africa, which included a series of seven case studies from Latin America documenting the unique and disproportionate impacts on women (Gibbon, 1992). The non-governmental organization also arranged for leaders from Sub-Saharan Africa to meet with members of the United States Congress in an effort to convince senators and representatives to withhold funding to the AfDB. In one instance, this involved President Julius Nyerere of Tanzania's appeal to United States lawmakers by asking: 'Must we starve our children to pay our debts?' or 'If it was your children suggesting second or third degree malnutrition, would you accept that the present form of adjustment was adequate?' (Jolly, 1991: 1818).

The AfDB reforms: health investment lending from 1990 to 2005

The AfDB responded in part by formulating its first health sector policy brief used to set forth principles to guide lending (AfDB, 2006). When the policy went into effect in 1990, the priorities identified included greater access to health care, training of medical professionals, procurement of essential drugs, and control of communicable diseases (AfDB,

2006). The AfDB sought to accomplish these objectives by offering concessional loans mainly via the AfDF (English and Mule, 1996). Initially, less than five percent of the AfDB's lending financed projects related to health (English and Mule, 1996). The projects that were funded supported the construction or rehabilitation of hospitals along with the training of doctors (AfDB, 1988). There was also an emphasis on improving hospital administration (AfDB, 2006).

For instance, the AfDB provided a $17.8 million loan to Niger to build a hospital, medical school, and necessary infrastructure at the University of Niamey. The project was financed in order to increase the capacity of the University of Niamey to train doctors by centralizing facilities into one location (AfDB, 1988). The AfDB financed similar rehabilitation and construction projects in Mali and Guinea. These projects emphasized renovation and equipping maternity wards with advanced technology as well as training doctors in an attempt to bring down infant and maternal mortality in those countries (AfDB, 1988).

As the AfDB revised its health policy in 1996 to better reflect the needs of the member countries, it acknowledged that most lending in the health sector to date, approximately 80 percent, financed hospitals in urban centers, which left the health needs of large numbers of people unattended (AfDB, 2006). These projects were also organized and managed vertically (e.g. little to no involvement from stakeholders). Its new guidelines sought to rectify these problems by emphasizing a focus on increased access to primary care especially for semi-urban and rural residents. This included ramping up immunization campaigns, setting up clinics in under-served locations, increasing access to contraception, and increasing prenatal and postnatal care for mothers. The AfDB also wanted more stakeholder participation in the preparation and implementation of its health projects (AfDB, 2006).

An example of this can be seen in the AfDB loan to Tanzania in 1997 to rehabilitate three hospitals in Dar es Salaam and expand training of doctors, nurses, and midwives at these facilities. However, it also involved the creation of 32 clinics elsewhere in the country to be staffed by health professionals trained in Dar es Salaam (AfDB, 1998). The focus of the clinics includes increasing the delivery of primary care for infant and family planning services for women. It also supported the control of endemic disease (e.g. filariasis, schistosomiasis, and intestinal parasitic infections) by providing essential drugs. Care was also taken to increase female involvement in health care, with women being trained to administer medications and monitor disease progression along with leading projects to increase access to clean drinking water and basic sanitation facilities (AfDB, 1998).

These projects indicate the AfDB's recognition that its health lending must go beyond building and rehabilitating hospitals. Rather, it needs to include projects that increased the delivery of primary care especially in rural areas and directed more attention to underlying causes of diseases (e.g. safe drinking water, basic sanitation facilities, reducing fertility, and malnutrition) (AfDB, 2006). Furthermore, the AfDB needed greater community participation in the planning and delivery of projects especially by women along with partnerships with non-governmental organizations and other multilateral institutions to help eliminate logistical problems that often emerge in delivering care (AfDB, 2008).

This is especially true for AfDB lending for projects to help nations in the areas of reproductive health, and, in particular, projects that deal with the spread and treatment of HIV (AfDB, 2010). Accordingly, the AfDB supports projects that seek to increase access to anti-retroviral drugs especially for pregnant women and infants, providing rapid testing to diagnose the disease, making contraception more widely available, and establishing a safer blood transfusion system (AfDB, 2001).

For example, the AfDB funded a project in Mali during this time. The project entailed increasing testing for HIV/AIDS and, when appropriate, providing immediate access to anti-retroviral medication (AfDB, 2005). This would be accomplished by training women in rural communities around the benefits of testing along with monitoring compliance with anti-retroviral medicines. It also involved efforts to increase enrollments of girls in school at the secondary level along with educational campaigns around how girls may best avoid contracting the disease (AfDB, 2005).

At the turn of the century, the AfDB reiterated its commitment to increased partnerships with multilateral institutions, non-governmental organizations, private foundations, and business, to deliver health services in Sub-Saharan Africa (AfDB, 2005). This was accomplished by promoting a 'sector-wide' approach, which seeks to eliminate the fragmentary nature of multiple donors funding ad hoc and even duplicate projects in the same country in favor of donor coordination (Gottret and Schieber, 2006). This involved the AfDB emphasizing increased policy dialogue with borrowing nations to set health priorities (Abbasi, 1999). While donors give up the right to select projects according to their own priorities, they gain a voice in the process of setting national health policy and decisions about how not only external but also internal resources are allocated via AfDB monitoring and evaluation (Cassels and Janovsky, 1998). In some instances, the partnerships may involve working with the World Health Organization, which provides technical assistance for improving the design, supervision, and evaluation of AfDB health projects (Ruger, 2005). In other instances, the AfDB may work with non-governmental organizations, private foundations, or businesses, to deliver services (AfDB, 2005).

This discussion leads us to our second hypothesis. We argue that when a Sub-Saharan African nation receives an AfDB investment loan in the health sector, then it will have less infant mortality than if it does not receive such a loan. We now provide an overview of the data that we use to test these hypotheses. While we provide an extensive justification of the AfDB lending variables above, we also include a number of other factors that have been found to explain infant mortality. These are drawn from existing cross-national work.

Dependent variable

Infant mortality

The dependent variable is the infant mortality ratio, which is the number of children who die before reaching the age of one per 100,000 live births. The data are available online from the WB's (2015) World Development Indicators for 1991, 1996, 2001, and 2006.

Independent variables

African Development Bank health loan

We include an independent variable that captures the effects of AfDB lending in the health sector. This is a dummy variable where Sub-Saharan African nations that received a health loan in 1990, 1995, 2000, or 2005, are coded with a value of one. All other Sub-Saharan African nations serve as the reference category. These data come from the AfDB (2006). All the independent variables are lagged by 1 year because they may not have an instant effect on infant mortality. We hypothesize that Sub-Saharan African nations that received an AfDB

health loan will have lower levels of infant mortality than Sub-Saharan African nations that did not receive such a loan.

African Development Bank structural adjustment loan

This is a dummy variable where we code Sub-Saharan African nations that are under an AfDB structural adjustment loan with a value of one. All other Sub-Saharan African nations serve as the reference category and are coded with a value of zero. These data may be obtained from the AidData's online database. We use the sector code for 'general budget support' to obtain at a list of loans. We then code structural adjustment loans from a project's title and description. From above, we hypothesize that Sub-Saharan African nations that received an AfDB structural adjustment loan will have higher levels of infant mortality than Sub-Saharan African nations that did not receive an AfDB structural adjustment loan.

World Bank or International Monetary Fund structural adjustment loan

This variable measures whether or not a nation received a WB or IMF structural adjustment loan. This allows us to differentiate the effect of AfDB structural adjustment on infant mortality from structural adjustment form these multilateral institutions. This variable has the same coding as the AfDB structural adjustment variable. These data may be obtained online from the IMF's *Lending Arrangements Database* and the WB's *Projects and Operations Database*. We hypothesize Sub-Saharan African nations under an IMF or WB structural adjustment will have increased infant mortality.

Debt service ratio

In addition to the pressure to adopt macro-economic policy reforms under structural adjustment, poor nations must continually service their foreign debts. Thus, we include the repayment of all long-term public debt. The data are measured as a percentage of exports of goods and services. This variable is logged to correct its skewed distribution. These data come from the WB (2015). We hypothesize that higher levels of debt service should be associated with increased infant mortality because it removes resources available for governmental investment in health, family planning, and reproductive services (Coburn et al., 2015).

Multinational corporate investment

We include the stock measure of multinational corporate investment as a percentage of gross domestic product (Jorgenson et al., 2007). These data may be obtained online from the United Nations Conference on Trade and Development statistical portal. We log this variable to correct for its skewed distribution. We expect that higher levels of multinational corporate investment should be associated with increased infant mortality in Sub-Saharan Africa. This is largely because multinational corporations monopolize access to capital, displace local business, slow economic growth, and promote income inequality, which can impact infant mortality (Shen and Williamson, 1999). See Wimberley (1990) for a detailed discussion regarding how this may occur.

Gross domestic product

We also include a measure of gross domestic product per capita at purchasing power parity. This variable is logged to correct for its skewed distribution. These data come from the WB (2015). We expect that higher levels of gross domestic product per capita should correspond with decreased infant mortality within Sub-Saharan African nations. This is because higher levels of wealth tend to bring higher standards of living, advanced medical technology, and demographic changes that lower infant mortality (Shen and Williamson, 1999).

Domestic investment

We also include a measure of domestic investment, known as gross capital formation, as a percentage of gross domestic product. We log domestic investment to deal with its skewed distribution. These data too come from the WB (2015). We hypothesize that higher levels of domestic investment should be associated with decreased infant mortality in Sub-Saharan Africa. This is most likely the case due to domestic investment increasing capital available for investment by governments for health and by increasing economic growth in a country (Rice, 2008).

Female secondary school enrollment

We use gross female secondary school enrollments as the indicator of educational attainment. We take the natural log of this variable to reduce its skewed distribution. The data come from the WB (2005). We hypothesize that higher levels of female secondary school enrollment should be related to lower infant mortality in Sub-Saharan Africa. This may well be because female education is associated with wider use of health services, especially prenatal and postnatal care (Filmer and Pritchett, 1999).

Democracy

We use the Freedom House's (2005) political rights and civil liberties scales to measure democracy. According to Freedom House (2005), political rights refer to the degree to which a nation is governed by democratically elected representatives and has fair, open, and inclusive elections. The civil liberties scale measures the level of freedom of press, freedom of assembly, general personal freedom, freedom of private organizations, and freedom of private property within a nation. The variables have the following coding: free (1–2), partially free (3–5), and not free (6–7). We multiply the index by negative one so that high scores correspond with high levels of democracy. We hypothesize that higher levels of democracy should correspond with decreased infant mortality in Sub-Saharan Africa. This is most likely the case because freely elected and open governments respond to popular demands for health services due to political activism and electoral accountability (Wickrama and Mulford, 1996).

Domestic conflict

This is a dummy variable for whether or not a Sub-Saharan African nation is experiencing conflict within its borders. These data may be obtained from Harbom and Wallensteen (2007). We expect that if a Sub-Saharan African nation is experiencing conflict, then it should have increased infant mortality. This is because conflict disrupts the ability of a government to deliver health

services while diverting investment away from this sector toward military spending (Buchmann, 1996).

Public health expenditures

We include public health expenditures as a percentage of gross domestic product in the models. This measure includes all current expenditures by all levels of government for the provision of medical services. These data may be obtained from the WB's World Development Indicators (2005). We expect higher levels of public health expenditures to be related to reduced infant mortality as government investment in hospitals and other services.

Immunization prevalence

We also examine how immunizations impact infant mortality in Sub-Saharan Africa. This variable measures average percentage of children 1 year of age or younger who receive vaccines against tuberculosis, polio, measles, and diphtheria. The data may be obtained from the United Nations State of the World's Children reports online. We expect that higher levels of immunization prevalence should correspond with decreased infant mortality in Sub-Saharan Africa as infants become immune to life-threatening illnesses (Buchmann, 1996).

Access to improved water source and sanitation facility

This variable measures the percentage of the country's population, which has access to an improved water source and sanitation facility. These data come from the World Bank (2015). According to the World Health Organization and United Nations Children's Fund (2010), an improved water source includes any of the following types of water sources: household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collection. An unimproved water source may include an unprotected well, surface water, vendor provided water, tanker provided water, and bottled water. An improved sanitation facility includes a connection to a public sewer, connection to a septic tank, pour flush latrine, simple pit latrine, ventilated pit latrine, pit latrine with slab, and composting toilet. An unimproved sanitation facility includes an open pit latrine, public latrines, buckets, latrines, hanging latrines, flush to elsewhere (e.g. street, yard, river, ditch), and no facility (World Health Organization and United Nations Children's Fund, 2010). We hypothesize that higher levels of access to improved water and sanitation should be related to less infant mortality. This is because polluted water contains microbes that cause diarrheal diseases and other infections (Rice, 2008).

Female human immunodeficiency virus prevalence

This variable measures the percentage of a country's female population ages 15 to 49 that are infected with HIV, whether or not they have developed symptoms of AIDS, alive at the end of the year specified. These data come from the WB (2015). We hypothesize that higher levels of female HIV prevalence should be associated with increased infant mortality. This is because infants may experience opportunistic infections (e.g. tuberculosis, pneumonia, and malaria) due to a weakened immune system from mothers, which lead to higher levels of infant mortality (Austin and McKinney, 2012). Table 1 presents descriptive statistics for all variables.

Table 1. Univariate descriptive statistics and bivariate correlations (N = 107).

Variable	Mean	Std. dev.	Correlation (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Infant mortality (per 100,000 live births) (1)	81.28	27.24	1.000														
AfDB health loan recipient (1=yes) (2)	0.49	0.50	-0.143	1.000													
AfDB str. adj. loan recipient (1=yes) (3)	0.37	0.48	0.216	0.136	1.000												
WB or IMF str. adj. loan recipient (1=yes) (4)	0.72	0.44	0.400	0.251	0.292	1.000											
Debt service ratio (5)	2.19	1.05	0.302	0.316	0.232	4.080	1.000										
Multinational corporate investment (6)	2.38	1.10	0.159	-0.142	-0.084	-0.155	-0.360	1.000									
Gross domestic product (7)	6.01	0.97	0.691	-0.303	-0.314	-0.524	-0.384	0.261	1.000								
Domestic investment (8)	2.89	0.32	-0.377	-0.091	0.005	-0.167	-0.037	0.151	0.271	1.000							
Female secondary school enrollment (9)	2.88	0.89	-0.809	-0.252	-0.250	-0.471	-0.364	0.347	0.781	0.274	1.000						
Democracy (10)	-4.29	1.59	-0.440	-0.076	-0.161	-0.098	-0.162	0.183	0.473	0.349	0.418	1.000					
Domestic conflict (1=yes) (11)	0.18	0.39	0.098	0.135	0.204	0.125	0.107	-0.120	-0.267	0.029	0.266	0.139	1.000				
Public health expenditures (12)	0.71	0.49	-0.307	-0.037	-0.198	-0.108	-0.301	0.257	0.265	0.213	-0.316	-0.339	0.007	1.000			
Immunization prevalence (13)	74.81	17.20	-0.570	0.011	-0.078	-0.181	-0.011	0.161	0.384	0.456	-0.491	-0.238	-0.101	0.404	1.000		
Water and sanitation source (14)	47.76	20.11	-0.636	-0.191	-0.136	-0.249	-0.088	0.146	0.450	0.227	-0.574	-0.390	-0.195	0.172	0.536	1.000	
Female HIV prevalence (15)	3.88	4.85	-0.194	-0.237	-0.131	-0.308	-0.357	0.302	0.441	0.052	-0.402	-0.178	-0.104	0.496	0.368	0.259	1.000

Sample

We restrict our sample to countries with available data for more than one time point following list-wise deletion for the period from 1990 to 2006. We restrict the sample to this time frame because of data availability. We are only able to obtain data on AfDB health lending (AfDB, 2006) and domestic conflict (Harbom and Wallensteen, 2007) up to 2005. We use 1990 as our starting year because several measures are not available prior to including access to an improved water source, access to an improved sanitation facility, female secondary school enrollments, and public health expenditures – see WB (2005, 2015). Furthermore, the AfDB did not begin making structural adjustment loans until the late 1980s. In the end, the following Sub-Saharan African nations are included in the analysis.

We highlight a given year in bold if a Sub-Saharan African nation was under an AfDB structural adjustment loan and italicize a given year if a nation received an AfDB health loan. They are: Benin (*1995*, 2000, *2005*), Botswana (1990, 1995, 2000, and 2005), Burkina Faso (*1990, 2000*, and *2005*), Burundi (*1990* and **2005**), Cameroon (***1990***, 1995, and **2005**), Cote d'Ivoire (***1990***, 1995, and 2000), Chad (**1995**, 2000, and **2005**), Democratic Republic of Congo (1990 and 1995), Ethiopia (**1995**, *2000*, and **2005**), Gambia (*1995, 2000*, and 2005), Ghana (*1990, 1995*, **2000**, and *2005*), Guinea (***1990***, 1995, **2000**, and *2005*), Kenya (**1990**, *1995*, ***2000***, and *2005*), Madagascar (**1990**, 1995, and *2005*), Malawi (**1990**, 1995, ***2000***, and *2005*), Mali (*1990*, ***1995***, 2000, and ***2005***), Mauritius (1990, 1995, 2000, and *2005*), Mozambique (***1995***, ***2000***, and *2005*), Namibia (1995, 2000, and 2005), Niger (*1990*, 1995, 2000, and ***2005***), Nigeria (1990, *2000*, and *2005*), Rwanda (1990, ***2000***, and *2005*), Senegal (**1990**, ***1995***, *2000*, and *2005*), South Africa (1990, 1995, 2000, and 2005), Sudan (**1990**, *1995*, and 2005), Swaziland (*1995*, 2000, and 2005), Tanzania (*1990* and *1995*), Togo (**1990**, ***1995***, ***2000***, and 2005), Uganda (*1990*, **1995**, ***2000***, and *2005*), Zambia (1995, ***2000***, and *2005*), and Zimbabwe (1990, **1995**, and **2000**).

Methodology

We estimate a two-way fixed effects regression model with robust standard errors clustered by country to examine the effect of AfDB lending on infant mortality within Sub-Saharan African nations. This is one of the most commonly used models by social scientists to deal with potential problems of heterogeneity bias (Hsiao, 2003). The issue of heterogeneity bias refers to the impact of unmeasured time-invariant variables that are omitted from a regression model. To deal with heterogeneity bias, fixed effects models control for omitted variables that are time-invariant but do not vary across cases. This is done by estimating unit-specific intercepts, which are the fixed effects for each case. This approach is appropriate for cross-national analysis because time-invariant unmeasured factors (e.g. climate, geography) can affect infant mortality in Sub-Saharan Africa. Thus, a fixed effects approach should provide a stringent assessment of the relationship between AfDB lending and infant mortality because the associations between the variables are estimated net of unmeasured between-country effects (Brady et al., 2007). Generally, this modeling strategy is robust against missing control variables (Hsiao, 2003).

The notation for the two-way fixed effects model is as follows

$$y_{it} = a + B_1 x_{it1} + B_2 x_{it2} + \ldots + B_k x_{itk} + u_i + w_t + e_{it}$$

where i is the each country in the analysis, t is the each time period in the analysis, y_{it} is the dependent variable for each country at each time period, a is the constant, B_1 to B_k are the coefficients for each independent variables, x_{itk} is the independent variables for each country at each

time point, u_i is the country-specific disturbance terms that are constant over time, w_t is the period-specific disturbance terms that are constant across all countries, and e_{it} is the disturbance terms specific to each country at each time point.

To determine if the two-way fixed-effects model is more appropriate than the random effects estimator, we calculate Sargan–Hansen test statistics for each model. The Sargan–Hansen test is asymptotically equivalent to the Hausman test of fixed versus random effects. However, it extends the Hausman in that it allows the incorporation of clustered robust standard errors that are employed to deal with heteroskedasticity that arises in the analysis of panel data due to nations being nested within time. See Baum (2006) for a full discussion of its calculation. The null hypothesis of the test follows a χ^2 distribution if the random effects estimator is more efficient. In our models, the test statistic reaches a level of statistical significance for every model, indicating that the fixed effects estimator is more efficient than the random effects estimator because the country-specific error terms are correlated with the independent variables included in the models (Baum, 2006). We also calculate a Wooldridge (2010) test for each model to determine if the models are affected by first-order autocorrelation. The coefficients for the *F*-test failed to reach a level of statistical significance. Therefore, we fail to reject the null hypothesis and conclude we have no potential problems with first-order autocorrelation.

Findings

In Table 2, we present the two-way fixed effects regression estimates of infant mortality in Sub-Saharan Africa.[1] In every equation, we include debt service, multinational corporate investment, gross domestic product per capita, female secondary school enrollments, domestic investment, democracy, internal conflict, public health expenditures, immunization prevalence, access to water and sanitation, and female HIV prevalence. In equation (2.1), we include only AfDB health lending. In equation (2.2), we add AfDB structural adjustment. In equation (2.3), we add WB and IMF structural adjustment to the model.

Let us begin with a discussion of the AfDB lending variables. In equation (2.1), we find that AfDB health lending is related to lower infant mortality. The coefficients for this variable are negative and significant in all three models. This effect remains even after controlling for AfDB structural adjustment.[2] In equation (2.2), the coefficient for the AfDB health-lending variable remains negative and significant. At the same time, the coefficient for the AfDB structural adjustment variable is positive and significant, indicating that Sub-Saharan African nations that receive structural adjustment loan have increased infant mortality. In equation (2.3), we add WB or IMF structural adjustment to the model. The coefficient for the AfDB health-lending variable remains negative and significant. The coefficient for the AfDB structural adjustment variable is still positive and significant. The coefficients for the WB and IMF structural adjustment variables are also positive and significant.[3] Taken together, the findings indicate that AfDB lending has contradictory effects on infant mortality in Sub-Saharan Africa. The beneficial effects of AfDB health lending appear to be offset by structural adjustment from the AfDB, WB, and IMF.

It is important to note that there are other factors that explain infant mortality among Sub-Saharan African nations. First, we find that another international factor is related to infant mortality. The coefficients for debt service are positive and significant in Table 2. Second, we find that domestic investment is associated with less infant mortality. The coefficients for this variable are negative and significant in all three equations. Third, we find that higher levels of female secondary school enrollments are associated lower infant mortality. The coefficients for this variable are negative and significant across Table 2. Fourth, we find that if a nation is experiencing domestic conflict, then it tends to have increased infant mortality. The coefficient is positive and significant in the three equations. Fifth, we find that three variables related to public health predict infant mortality. The coefficients for

Table 2. Two-way fixed effects estimates of infant mortality in Sub-Saharan Africa (1990–2005).

Independent variables	Equation (2.1)	Equation (2.2)	Equation (2.3)
African Development Bank health recipient	−5.081**	−6.551**	−6.244**
(1 = Yes)	−0.095	−0.108	−0.102
	(1.982)	(2.042)	(2.005)
African Development Bank structural adjustment		4.473*	4.447*
Recipient (1 = Yes)		0.073	0.073
		(1.911)	(1.924)
World Bank or International Monetary Fund			3.443*
Structural adjustment recipient			0.054
(1 = Yes)			(1.987)
Debt service ratio	3.879*	3.805*	(3.803*
	0.164	0.160	0.161
	(1.885)	(1.776)	(1.774)
Multinational corporate investment	−0.042	−0.247	−0.140
	−0.002	−0.012	−0.007
	(1.381)	(1.278)	(1.323)
Gross domestic product per capita	10.479	11.204	11.202
	0.342	0.366	0.366
	(10.612)	(9.488)	(9.931)
Domestic investment	−9.744***	−11.576***	−11.503***
	−0.133	−0.159	−0.158
	(2.745)	(2.804)	(2.791)
Female secondary school enrollment	−25.395***	−25.101***	−24.422***
	−0.733	−0.727	−0.705
	(4.688)	(4.391)	(4.732)
Democracy	−0.013	−0.492	−0.697
	−0.001	−0.027	−0.038
	(1.065)	(.952)	(3.275)
Domestic conflict (1 = Yes)	7.831*	7.392*	6.287*
	0.099	0.094	0.080
	(3.827)	(3.354)	(3.257)
Public health expenditures	0.190	0.454	−0.520
	0.003	0.007	−0.008
	(3.620)	(3.321)	(3.202)
Immunization prevalence rate	−0.243**	−0.259**	−0.252**
	−0.143	−0.152	−0.148
	(0.092)	(0.098)	(0.091)
Access to improved water and sanitation source	−0.133*	−0.171**	−0.179**
	−0.079	−0.102	−0.107
	(0.069)	(0.061)	(0.057)
Female HIV prevalence	1.122**	1.137***	1.134***
	0.156	0.158	0.157
	(0.356)	(0.319)	(0.320)

(Continued)

Table 2. (continued)

Independent variables	Equation (2.1)	Equation (2.2)	Equation (2.3)
Year 1995	−0.155	0.725	0.959
	−0.005	0.024	0.032
	(3.154)	(3.216)	(3.305)
Year 2000	−3.992	−3.626	−3.462
	−0.134	−0.122	−0.116
	(4.144)	(3.925)	(3.971)
Year 2005	−3.519	−2.043	−2.065
	−0.118	−0.069	−0.069
	(5.016)	(4.931)	(4.995)
Constant	124.888*	134.158*	128*
	(64.074)	(56.974)	(60.227)
Overall R^2	0.615	0.627	0.642
Number of observations	102	102	102
Number of countries	31	31	31
Sargan–Hansen test statistic	81.097***	119.421***	89.386***

The first number is the unstandardized coefficient, the second number is the standardized coefficient, and the third number is the robust standard error clustered by country. The null hypothesis for the Sargan–Hansen test is that the random effects estimator is more efficient than the fixed effects estimator. We reject the null hypothesis in all three models.
*Indicates $p < 0.05$, ** indicates $p < 0.01$, and *** indicates $p < 0.001$ for a one-tailed test.

immunizations and access to improved water and sanitation are negative and significant in Table 2.[4] Furthermore, the coefficients for female HIV prevalence are positive and significant.

There are also some non-significant findings that merit comment.[5,6] First, we find that gross domestic product per capita does not explain any significant variation in infant mortality. The coefficients for that variable do not reach a level of statistical significance in any equation. Second, we do not find that multinational corporate investment is associated with infant mortality. We also find that neither democracy nor public health expenditures are related to infant mortality in Sub-Saharan Africa. The coefficients for both variables do not reach a level of significance.[7,8]

Discussion and conclusion

We began the article by noting that there is an extensive empirical literature based on insights from dependency theory that links structural adjustment to health issues in poor nations. However, cross-national work in this area focuses on IMF and WB. There is little research that examines the impact of structural adjustment from regional lenders like the AfDB. This serves as the starting point of our article. Accordingly, we find that AfDB structural adjustment is associated with increased infant mortality along with WB and IMF structural adjustment.

While this is an important gap to address, we go beyond it. Following the publication of the UNICEF's (1987) 'Adjustment with a Human Face' and pressure by a variety of actors on the AfDB to the reform that followed, it responded by increasing investment lending in the health sector to offset the deleterious effects of structural adjustment. Thus, we also considered the impact of AfDB investment lending in the health sector. In doing so, we find that AfDB health lending is associated with decreased infant mortality. The findings indicate that the AfDB provides loans to nations that exhibit contradictory effects on infant mortality in Sub-Saharan Africa.

How may we explain the contradictory findings regarding the AfDB lending that we observe here? In answering this question, we discuss the theoretical implications of the study. The results embody ideas put forth by Weaver (2008) in 'Hypocrisy Trap: The World Bank and the Poverty of Reform'. The author draws on the theory of 'organized hypocrisy' from the sociology of organization literature to argue that the WB does not pursue a coherent agenda but rather *different* and *contradictory* agendas when it implements reforms in response to external pressures that threaten its legitimacy and resources. The same process appears to be at work at the AfDB.

On the one hand, the United States Treasury (and, most likely, private capital markets), which the AfDB depends for capital replenishments, drives it to adopt a 'finance ministry' agenda (Weaver, 2008). This involves the AfDB implementing lending programs based on market-oriented principles associated with structural adjustment even if it means worsening health in borrowing nations. These principles serve the interests of capital markets, United States and European multinational corporations, and the United States Treasury, by opening the economies of Sub-Saharan African to trade and financial flows from donor nations (Weaver, 2008).

On the other hand, the AfDB must also be deferential to issues being raised by the United Nations agencies, non-governmental organizations, and lawmakers from donor governments especially the United States Congress (Weaver, 2008). These groups are pushing the AfDB to adopt a 'civil society' agenda based upon more socially oriented lending, conceptualized here as investment lending for health, that tends not to correspond with the 'finance ministry' agenda (Weaver, 2008). Thus, like the WB, the AfDB ends up facing 'the necessity of appearing responsive to both sets of demands, reacts by embracing both sets of agendas in its broad policy paradigms, leaving the inconsistencies and contradictions to be worked out in its daily operations' (Weaver, 2008: 32). Specifically, the AfDB provides borrowing nations with structural adjustment and health loans that have different effects on infant mortality.

We argue that cross-national research should *not only* consider how factors promoting a 'finance ministry' agenda and hypothesized by dependency theory affect health, *but also* consider insights from the theory of organized hypocrisy, which is drawn from the organizational sociology literature. This is because multilateral financial institutions like the AfDB tend to enact reforms promoting a 'civil society' agenda (i.e. health investment lending) as a result of pressure from external actors (e.g. United Nations agencies, non-governmental organizations, United States lawmakers) that threaten their legitimacy and resources (Weaver, 2008). Toward this end, it is only when researchers consider *both* sets of factors will we arrive at the most comprehensive understanding of how the AfDB in particular and international financial institutions in general impact well-being.

There is an important methodological implication that emerges too. It is typical for cross-national research to include dummy variables for the region of the world in which a country is located as independent variable in a regression analysis. This helps to control for findings that may arise out of geographical or historical circumstances, which cannot be accounted for by the independent variables in the models. Often, there are statistically significant differences in the dependent variable under examination among the various regions. We address these issues here by examining the factors associated with infant mortality in *only* Sub-Saharan Africa. This allows us to offer more accurate policy prescriptions because we can move beyond speculating why regional differences exist and model how they are affecting infant mortality.

There are some policy implications that follow from the main findings. The most prominent is that there should be an expansion of AfDB investment in the health sector. This should include funding for projects that expand immunizations, improve access to safe drinking water, build basic sanitation facilities, and seek to reduce HIV in women. There should also be an effort to make sure that health projects include components that boost women's education. This not only has the

potential to deliver macro-economic benefits including increased economic growth and living standards, but also is likely to result in higher immunization coverage for infants (Lena and London, 1993). Because debt service is associated with increased infant mortality in this study, the AfDB should fund such projects via grants rather than loans to avoid nations from adding to already high debt (Bryant and Bailey, 1997).

Given that AfDB (along with WB and IMF) structural adjustment tends to offset the benefits of its health investment lending, critics may argue that the preceding policy suggestions are 'reformist' because they do not *fundamentally* address the causes of infant mortality (Bryant and Bailey, 1997). Accordingly, the AfDB's investment lending in the health sector could be criticized as being ineffectual and 'probably serving more of a political purpose in giving adjustment the appearance of a human face rather than a genuine compensatory purpose' (Oxfam, 1993: 25). Thus, alternative models to AfDB investments should be considered.

What might these alternatives look like? Sub-Saharan African nations may be better suited to seeking out investment from middle-income nations like Brazil, Russia, India, and China. However, there is criticism of such investment. For instance, China is accused of supporting projects in Sub-Saharan African countries with some of the worst human rights records. There is also concern that Chinese investment leads to extensive environmental degradation. Nevertheless, Bräutigam (2011) finds little support for such claims in her book, 'The Dragon's Gift', and observes that investment by China tends to be 'untied' (not having the macro-economic policy reforms associated with structural adjustment loans). In one instance, Bräutigam (2011) notes that a low interest loan to Angola with payment guaranteed by oil revenues led to the building of hospitals, schools, and other infrastructure, but an IMF structural adjustment loan that required the government to reduce corruption to receive the money was never disbursed.

Of course, this investment is still driven by external actors (who most likely will have some sort of underlying interests) and, therefore, should only be one part of a longer-term strategy to improve well-being. Sub-Saharan African nations should use such aid to support local industry and business, thereby eliminating the need for loans from the AfDB altogether (especially with our findings indicating that domestic investment leads to less infant mortality). This has the potential to reduce non-regional members' influence in the AfDB by eliminating its need for continual recapitalization. In such situations, Sub-Saharan African nations may be in a position to renegotiate decision making at the AfDB, which would allow regional member nations to put into place policies that are applicable to the circumstances of individual nations and benefit their populations accordingly – one of the driving principles of the AfDB when it was founded.

There are some potential limitations and directions for future research that correspond with the study. First, it is difficult to separate the effects of structural adjustment from other factors on health in cross-national research (Abouharb and Cingranelli, 2009). One needs to take care in determining if the effects of an AfDB loan on health are due to a loan itself or the characteristics of a nation that makes it a good candidate for an AfDB loan in the first place (e.g. balance of payment issues due to exogenous shocks). Thus, the results should be interpreted with caution.[9] Second, we are examining the determinants of infant mortality in Sub-Saharan African where many governments may lack the capacity to collect data in systematic ways due to a variety of factors (e.g. conflict, poverty, corruption). Readers should keep this in mind when interpreting the findings. Third, we use data for 36 nations for the period from 1990 to 2006. This is largely due to data availability issues for several independent variables such as public health expenditures, female education, access to an improved water source, and access to an improved sanitation source. As more data become available in the future, such analyses as we undertook here can be refined. In the meantime, cross-national research like our study needs to be supplemented with case studies that help to determine how the patterns of results converge or diverge in a specific place across longer periods of time.

Declaration of Conflicting Interests

Funding

Notes

1. We take potential violations of regression assumptions seriously. There is one exceedingly high correlation among our independent variable. It is between gross domestic product per capita and female secondary school enrollments (0.781). Thus, we may have a problem with multicollinearity, especially if variance inflation factor scores exceed a value of 2.5 (Allison, 2012). We run a pooled cross-sectional regression model and calculate variance inflation factor scores for the three equations presented in Table 2. The highest variance inflation factor score for all three models corresponds with gross domestic product per capita. In equations (2.1), (2.2), and (2.3), it is equal to 4.3, 4.5, and 4.7 respectively. In equations (2.1), (2.2), and (2.3), the variance inflation factor scores for female secondary school enrollments are equal to 3.4, 3.5, and 3.6 respectively. All other scores are below 2.5. Thus, we deal with this issue by running the models excluding both of the highly correlated variables and only one of the variables at a time. In these models, the variance inflation factor scores for all the independent variables do not exceed a value of 2.5. The results of these model specifications are similar to the models that we present with the coefficients for the AfDB variables retaining their signs and levels of significance. This should not be surprising as Allison (2012) notes that multicollinearity only affects the coefficient and standard errors for the highly correlated measures. Thus, we concur with Allison (2012) that although multicollinearity may be present in the analysis, it is not affecting the findings in a substantive way.
2. We run the analysis using a refined measure of AfDB structural adjustment. This includes only nations that received an AfDB structural adjustment loan in the health sector. The coefficients for this variable are positive and significant.
3. We explored other lag structures including 2 and 3 years. The results are comparable.
4. Jorgenson et al. (2012) find that higher levels of urban slum prevalence are associated with increased infant mortality especially in Sub-Saharan Africa. We test this hypothesis here, but do not find support for it. This is most likely due to the smaller sample size that results from including this variable.
5. We considered if several other measures impacted infant mortality including caloric intake, urbanization, and the age dependency ratio. The coefficients for these variables fail to reach a level of statistical significance.
6. Sanderson and Kentor (2009) demonstrate the importance of considering immigration and other human migration patterns in cross-national research. We examine the impact of international migrants from a Sub-Saharan African nation in our models. The coefficients for this variable do not reach a level of statistical significance.
7. We rerun the models excluding the non-significant variables in an effort to increase the reliability of the findings. The results remain similar to the findings presented.
8. The non-significant finding regarding public health expenditures is somewhat surprising but not unprecedented. Public health spending often tends to fund the building of hospitals and the treatment of non-communicable diseases, which may not have an immediate impact of infant mortality. Buchmann (1996) argues this in her study of maternal mortality and suggests that a better proxy may be immunization prevalence because governments are responsible for delivering this service. Our results lend credence to this argument. The coefficients for immunization variable are negative and significant in the analysis.
9. As noted, the fixed effects models hold constant unobserved time-invariant factors. This likely solves the potential problem of selection bias due to unobservable factors. However, it does not correct for the possibility that some unobserved time-varying factors lead a country to receive an AfDB structural adjustment or health loan (Stuckler et al., 2008). Thus, to determine if non-random selection bias due

to time-varying unobservable factors is a problem, we use a 'control function' approach described by Stuckler et al.'s (2008). See Stuckler et al. (2008) for a more detailed discussion of this method. This approach involves estimating a two-stage model. In the first stage, a selection equation is estimated using a random effects probit regression. The dependent variable in the selection equation is a dichotomous variable that indicates whether a nation received an AfDB structural adjustment or health loan. The independent variables are the factors hypothesized to influence whether or not a nation received an AfDB structural adjustment or health loan in a given year. We draw upon Abouharb and Cingranelli (2009) to specify independent variables for the selection equation. The independent variables are gross domestic product per capita, debt service, foreign currency reserves, exchange rate value, an alliance with the United States, and respect for worker rights. See Abouharb and Cingranelli (2009) for a discussion of these variables. The residuals of the probit analysis are saved and then used to construct a control function (i.e. an inverse Mills ratio), which is commonly referred to as lambda. The lambda variable captures the effects of characteristics related to whether or not a nation receives an AfDB structural adjustment or health loan for independent variables not included in the model.

In the second stage, a substantive equation is estimated using a random effects regression model. The dependent variable in the substantive equation of this analysis is the infant mortality rate. In this stage, lambda is included as an independent variable along with the dummy variable representing if a nation received an AfDB structural adjustment or health loan. Because the coefficient for lambda reflects the effect of the variance unexplained by the predictors in the first stage of the model, we are controlling for the effects of the variables that predict whether a nation has been a recipient of an AfDB structural adjustment or health loan. When selection bias is negligible, lambda is not statistically significant, and the random effects estimates of the substantive parameters have optimal properties. A statistically significant coefficient for lambda indicates that non-negligible sample selection bias exists in the model. The specifications for the infant mortality model are the same as Table 2. The coefficients for the lambda coefficients are not statistically significant in either the AfDB structural adjustment or AfDB health-lending equations, indicating that selection bias should not be a problem in the analysis. For the final models we present in this article, we use fixed effects regression estimates (presented in Table 2) for the methodological reason that the orthogonality condition of the random effects estimator (i.e. that the individual predictors are uncorrelated with the group-specific error) is an over-identifying restriction.

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